

Chapter 3. Geology and Soils

The Plan area is characterized by long, narrow valleys with moderate to steep sloping hillsides. Topography ranges from gently rolling and nearly level land to steep slopes. Elevations range from 1,650 feet to approximately 2,050 feet above sea level.

Figure 3-1 is a generalized slope map that displays slopes in three categories: 0%-5%, 5%-15%, and 15% and above. As shown, just over one-half of the site has slopes greater than 15%, with the other one-half being less than 15%. Both categories are scattered throughout the Plan area.

Geology

Geology is characterized by granodiorite rocks, metavolcanic flows, metavolcanic tuffs, and metashales. Information for the following is based on the Handbook of Environmental Geology (Placer County Planning Department 1976).

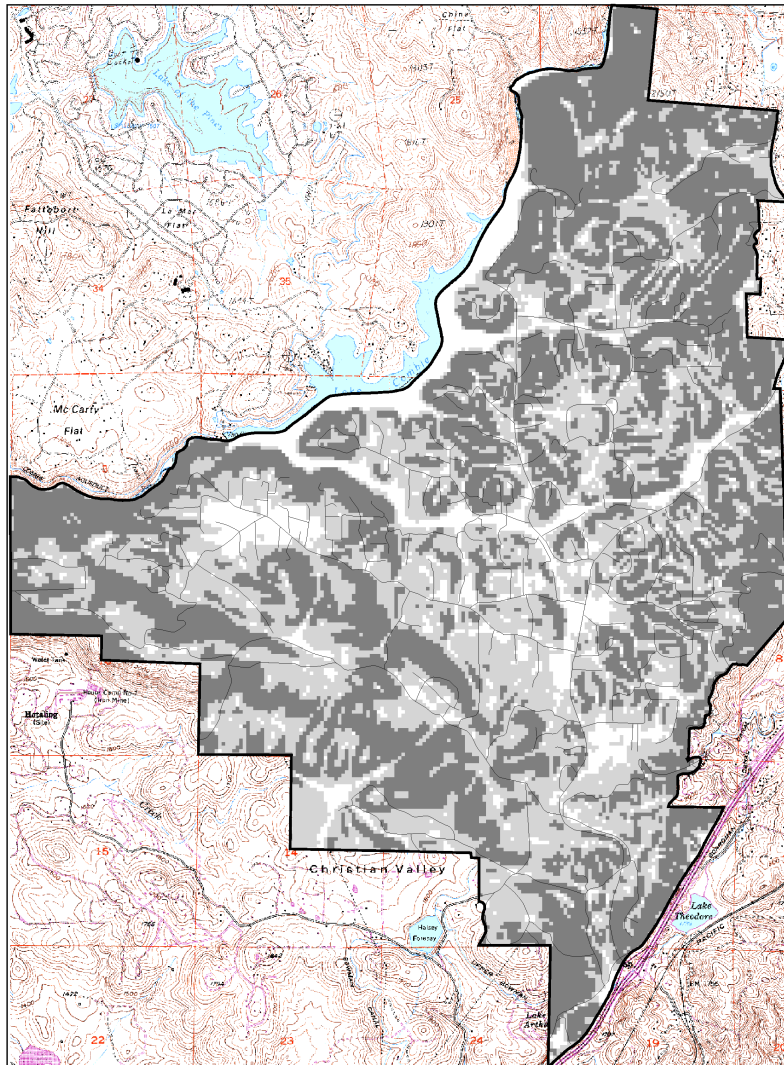
Granodiorites (grg). Granitic rocks occur at Sugar Pine Mountain over a 3-mile circular area extending from 0.5 to 3.5 miles west of Meadow Vista. A majority of the rock is moderately weathered at the surface and is therefore a limited source of decomposed granite. Outcrops occur extensively on steep slopes. The moderately weathered material is relatively stable on steep cuts. Soils over this feature are relative thin. Decomposed granitic rock located on steep slopes is susceptible to slumping and gullying from runoff.

Metavolcanic Flows (mvf) and Metavolcanic Tuffs (mvt). Metavolcanic flows consist of intensely weathered and fractured greenstone deposited by lava flows. These flows created rocks that are generally massive and show no bedding structure, although they are intensely fractured and deeply weathered. The rock is iron rich and produces thin, dark red, iron-rich soil. Where weathering has not penetrated deeply, the material may be suitable for quarrying and crushing for road base and aggregate.

Metavolcanic tuffs consist of soft, thin, platy, intensely weathered, and deeply weathered material that was originally deposited as volcanic ash. Metavolcanic tuffs occur as lenses within the metavolcanic flows. The bedding trends north-south and is vertical. Open cuts are highly susceptible to ravelling and shallow slips along bedding and fracture plans. Soil formed from this unit has shallow to moderate depths.

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Figure 3-1: Generalized Slope Map



— Planning Boundary
— Roads
Percent slope
0 - 5%
5 - 15%
> 15%

0.5 0 0.5 Miles
Scale 1" = 2,500'

Source: Fire and Resource Assessment
Program of the California Department of
Forestry and Fire Protection



Metashales (msh). Metashales occur in the Plan area along I-80. In general, the rocks are soft and intensely jointed. This unit is subject to ravelling and shallow slips along fracture planes in open cuts.

Soils

The U.S. Natural Resources Conservation Service (NRCS) has mapped soil series and their associated units in the Plan area. Figure 3-2 illustrates these soil mapping units. The physical properties of the mapping units are generally similar, exhibiting only minor variations; therefore, for the purpose of this discussion, only a general description of the soil series (as defined by the NRCS) is presented.

Argonaut Soils. Argonaut soils are moderately deep (from 22 to 34 inches) and well drained, underlain by metamorphic rock on broad ridges and swales on foothills. Soil textures range from silt loams in the surface horizons to clay in the subsurface. These soils typically exhibit slight to moderate erosion potential, low shrink-swell potential in the surface horizon, and high shrink-swell potential in the subsurface horizon. Argonaut soils have severe restrictions for on site wastewater disposal systems due to slow percolation rates and shallow depth to bedrock. These soils have poor to fair ratings for crop and range land uses.

Auburn Soils. Auburn soils are shallow (from 12 to 28 inches deep) and well drained silt loams that are typically underlain by metamorphic rocks in foothill areas. These soils exhibit slight to moderate erosion hazard and low shrink-swell potential. Auburn soils have severe restrictions for on site wastewater disposal systems due to shallow depth to bedrock. These soils have a fair rating for crop and range land uses.

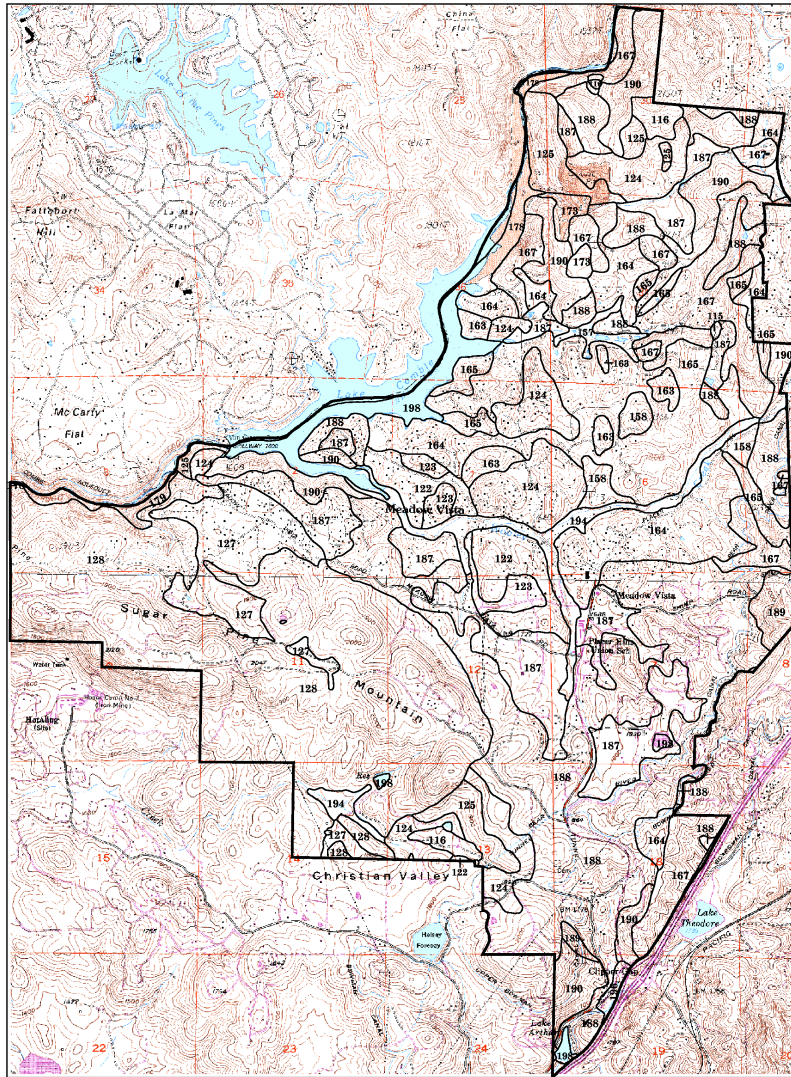
Boomer Soils. Boomer soils form on syenite in mountainous uplands. These soils are typically deep (from 50 to 72 inches) loams to gravelly clay loams with low to moderate shrink-swell potentials that exhibit slight to moderate erosion hazard. Boomer soils have severe restrictions for on site wastewater disposal systems due to shallow depth to bedrock, slow percolation rates, and steep slopes. These soils have a poor to fair rating for crop uses and have not been rated for range land uses. The Boomer loam (map unit 122) has been listed by the U. S. Department of Agriculture Land Inventory and Monitoring Project for the Placer County, Western Part, Soil Survey as prime farmland or farmland of statewide importance.

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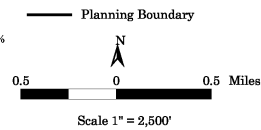
Source: Fire and Resource Assessment
Program of the California Department of
Forestry and Fire Protection

Figure 3-2: Soils Map



Soil Series

- | | |
|---|---|
| 115 AUBURN-ARGONAUT COMPLEX, 2 - 15 % | 164 MARIPOSA-JOSEPHINE COMPLEX, 5 - 30 % |
| 116 AUBURN-ARGONAUT-ROCK OUTCROP COMPLEX, 2 - 15 % | 165 MARIPOSA-JOSEPHINE COMPLEX, 30 - 50 % |
| 122 BOOMER LOAM, 2 - 15 % | 167 MARIPOSA-ROCK OUTCROP COMPLEX, 5 - 50 % |
| 123 BOOMER LOAM, 15 - 30 % | 173 PITS AND DUMPS |
| 124 BOOMER-ROCK OUTCROP COMPLEX, 5 - 30 % | 178 RIVERWASH |
| 125 BOOMER-ROCK OUTCROP COMPLEX, 30 - 50 % | 179 ROCK OUTCROP |
| 127 BOOMER VARIANT STONY SANDY LOAM, 2 - 15 % | 187 SITES LOAM, 9 - 15 % |
| 128 BOOMER VARIANT VERY STONY SANDY LOAM, 15 - 50 % | 188 SITES LOAM, 15 - 30 % |
| 138 COHASSET COBBLY LOAM, 15 - 30 % | 189 SITES LOAM, 30 - 50 % |
| 157 JOSEPHINE LOAM, 2 - 9 % | 190 SITES-ROCK OUTCROP COMPLEX, 15 - 30 % |
| 158 JOSEPHINE LOAM, 9 - 15 % | 194 XEROFLUENTS, FREQUENTLY FLOODED |
| 159 JOSEPHINE LOAM, 15 - 30 % | 196 XERORTHENTS, CUT AND FILL AREAS |
| 163 MARIPOSA GRAVELLY LOAM, 5 - 30 % | 198 WATER |



Josephine Soils. These deep soils (from 40 to more than 60 inches) are well drained and exhibit a slight to moderate erosion hazard and low to moderate shrink-swell potential. Josephine soils have severe restrictions for on site wastewater disposal systems due to shallow depth to bedrock and slow percolation rates. Josephine loams (map units 157 and 158) have been listed by the U.S. Department of Agriculture Land Inventory and Monitoring Project for the Placer County, Western Part, Soil Survey as prime farmland or farmland of statewide importance.

Mariposa Soils. The shallow to moderately deep Mariposa soils (from 15 to 35 inches) are well drained gravelly loams to gravelly clay loams with low shrink-swell potential and slight to moderate erosion potential. Mariposa soils have severe restrictions for on site wastewater disposal systems due to shallow depth to bedrock and steep slopes. These soils have a very poor rating for crop uses and have not been rated for range land uses.

Pits and Dumps. Pits and dumps are barren sand and gravel pits, refuse dumps, and rock quarries that exhibit highly variable physical properties.

Riverwash. Riverwash occurs in and along channels of the Bear River. The material is highly stratified stony and rocky sand.

Site Soils. The deep Sites soils (from 40 inches to more than seven feet) are well drained loams to clay that exhibit low shrink-swell potential and slight erosion potential.

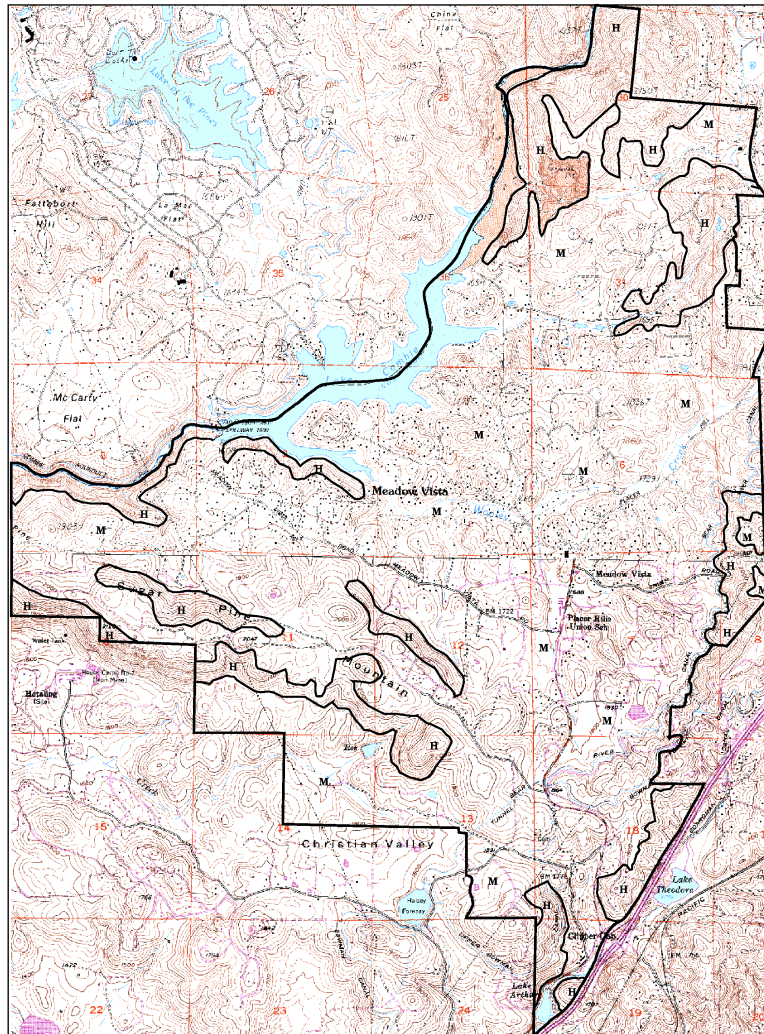
Xerofluvents. Xerofluvents consist of localized areas of frequently flooded loamy alluvium adjacent to stream channels. These soils are typically greater than 60 inches thick and exhibit low erosion hazard and low shrink-swell potential.

Soil Erosion

The degree to which erosion occurs depends on soil type, topography, land use, and vegetation. High-intensity rainfall will produce large amounts of overland flow, causing more erosion than gentle rains. Steep slopes cause runoff to move at high velocities and thus create greater erosion rates than gentle slopes. Vegetation growth will decrease the erosion rate because it reduces raindrop impact and puddling on the soil surface, along with the root systems of plants aiding soil stability. Figure 3-3 shows potential erosion hazards per Board of Forestry criteria.

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Figure 3-3: Potential Erosion Hazard



— Planning Boundary
— Potential Erosion Hazard

0.5 0 0.5 Miles

Scale 1" = 2,500'

Source: Fire and Resource Assessment
Program of the California Department of
Forestry and Fire Protection



The soils in the Plan area (some of which have steep slopes and loose textures) generally exhibit moderate erosion potential and are particularly susceptible to erosion when exposed on embankment faces and slopes. The effects of erosion range from nuisance problems to extreme cases where watercourses are downcut and gullies develop that can eventually undermine adjacent structures or vegetation.

IMPACTS

Criteria for Determining Significance

Significance criteria were developed from Appendices G and I of the State CEQA Guidelines and from professional practice. A project will normally have a significant impact if it will:

- Result in substantial disruptions, displacements, compaction, or overcovering of the soil;
- Result in substantial increase in wind or water erosion of soils, either on or off the site;

Relevant Community Plan Goals, Policies, and Implementation Programs

The Meadow Vista Community Plan includes various goals, policies, and implementation programs intended to protect the natural features of the Plan area, minimize geologic hazards, and protect soil resources.

Policies

- 9.K.4.** The County shall ensure that areas of slope instability are adequately investigated and that any development in these areas incorporates appropriate design provisions to prevent landsliding.
- 9.K.5.** In landslide hazard areas, the County shall prohibit avoidable alteration of land in a manner that could increase the hazard, including concentration of water through drainage, irrigation, or septic systems; removal of vegetative cover; and steepening of slopes and undercutting the bases of slopes. [8.A.5.]

Impact Analysis

The Vegetation Management Project is consistent with and supports policies of the Meadow Vista Community Plan. Specific impacts of the project are discussed below.

Portions of the Plan area contain gently rolling hills, scenic ridge lines, and large rock outcroppings. The MVCP discourages development on slopes exceeding 30%; however, vegetation management and fuel load reduction activities in areas of steep slopes could increase the potential for unstable slope conditions and ground failure, potentially exposing people and property to geologic hazards. The State Department of Mines and Geology is part of the CDF's Review Team for PTHPs.

Vegetation removal can increase soil moisture levels by reducing transpiration rates. As soil moisture levels increase, frictional forces between bedding planes decrease, which increases the potential for landslides. Vegetation management and healthy forest activities for fuel load reduction projects would disrupt normal soil conditions and remove vegetative cover and the litter layer, exposing the soil to raindrops and overland flow which could increase erosion rates.

Soils in the Plan area exhibit a moderate to high erosion potential that, when combined with ground-disturbing activities could substantially increase the potential for wind and water erosion on exposed areas and could increase the potential for sedimentation of local watercourses and wetlands. Under this condition, there can also be a substantial reduction in soil organic matter, resulting in a loss of soil productivity.

Limited removal of woody vegetation on areas with moderate to high erosion hazard ratings would maintain sufficient cover and not substantially increase soil erosion or reduce soil productivity. Impacts in these areas are not considered significant.

The use of heavy equipment can destroy natural soil structure that minimizes erosion. The use of heavy equipment and construction of access roads have the potential to cause sedimentation and degradation of watercourses and wetlands.

California Forest Practice Rules Requirements

All applicable Forest Practice Rules will apply to any PTHP undertaken pursuant to this PTEIR. The following Rules are particularly relevant for geology and soils. As part of the project description, they will reduce many potential impacts to a less than significant level.

1. Map all known unstable areas or slides on the PTHP map submitted for review by CDF. (1092.9(1)(11)).
2. Heavy equipment shall not be operated on unstable areas. (934.2(d)).
3. Tractor roads shall be limited in number and width to the minimum necessary for removal of logs. When less damage to the resources specified in 14 CCR 934 will result, existing tractor roads shall be used instead of constructing new tractor roads. (934.2(c)).
4. Slash and debris from timber operations shall not be bunched adjacent to residual trees required for silvicultural or wildlife purposes, or placed in locations where they could be discharged into a Class I or II watercourse or lake. (934.2(e)).
5. Tractor yarding or the use of tractors for constructing layouts, firebreaks or other tractor roads shall be undertaken only during dry, rainless periods where soils are not saturated. (934.7(c)(1)).
6. Required waterbreaks shall be located to allow water to be discharged into some form of vegetative cover, duff, slash, rocks, or less erodible material wherever possible, and shall be constructed to provide for unrestricted discharge at the lower end of the waterbreak so that water will be discharged and spread in such a manner that erosion shall be minimized. Where waterbreaks cannot effectively disperse surface runoff, including where waterbreaks on roads and skid trails cause surface run-off to be concentrated on downslopes, roads or skid trails, other erosion controls shall be installed as needed to comply with Title 14 CCR 934. (934.6(f))
7. The following standards are applicable to the construction of waterbreaks:

- a. All waterbreaks shall be installed no later than the beginning of the winter period of the current year of timber operations, except as otherwise provided for in the rules.
- b. Waterbreaks shall be constructed concurrently with the construction of firebreaks and immediately upon conclusion of use of tractor roads, roads, layouts, and landings which do not have permanent and adequate drainage facilities, or drainage structures.
- c. Distances between waterbreaks shall not exceed the following standards:

<u>Estimated Hazard Rating</u>	<u>Road or Trail Gradient (in percent)</u>			
	<u><10%</u>	<u>11-25%</u>	<u>26-50%</u>	<u>>50%</u>
Extreme	100 ft	75 ft	50 ft	50 ft
High	150 ft	100 ft	75 ft	50 ft
Moderate	200 ft	150 ft	100 ft	75 ft
Low	300 ft	200 ft	150 ft	100 ft

8. A winter operation plan shall be required for any winter harvest or fuel management activity.

MITIGATION

1. Develop a slope map for the PTHP project site or have project maps on current USGS topographic map base.
2. Install waterbars on all exposed soil, heavy equipment trails, and roads no further apart than the Forest Practice Rules Moderate Erosion Hazard rating distance.
3. Restrict timber operations to those areas with low or moderate Erosion Hazard Ratings (EHRs) with slopes less than or equal to 50%. Prohibit timber operations on areas of high or extreme EHR or on slopes over 50%.

4. Require re-stocking in conformance with recommendations of the Registered Professional Forester (RPF) as contained in the PTHP.
5. Require that a minimum of existing organic matter be left on site to reduce energy of rainfall and lower potential erosion. Also, in areas of defensible landscape, lop and/or crush slash and leave it on the ground to further reduce the impact of rain on bare soil.
6. Lop all slash to less than 20 inches above ground, except in areas where higher standards apply (within 100 feet of residences).
7. Prohibit use of heavy equipment within any Watercourse and Lake Protection Zone (WLPZ) except at existing road crossings, thus protecting existing watercourses.
8. Allow only alternatives to WLPZ protection measures that increase the WLPZ width or restrictions within the zone. No decreased restrictions will be allowed.
9. Avoid heavy equipment use on saturated or near-saturated soils.
10. Restrict vegetation removal on landslide-prone areas.
11. Conduct mechanical treatments along contours on areas of moderate to high erosion hazard ratings.
12. New road construction shall be less than 100 feet in length, be on average slopes of less than 20%, involve no substantial cuts and/or fills, and may not occur in any Watercourse and Lake Protection Zone (WLPZ).
13. Allow only in-lieu winter operating plans that do not allow operations in WLPZ or on unstable ground.

Level of Significance Following Mitigation

With implementation of the recommended mitigation measures, impacts to geology and soils will be mitigated to a less than significant level.